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(54) **ALARM SYSTEM AND METHOD FOR VEHICLE**

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(52) **U.S. Cl.** **340/457**; 340/457.1; 340/459; 340/438; 180/271; 180/286
(58) **Field of Search** 340/457, 457.1, 340/459, 461, 438, 460; 180/271, 286; 701/29; 307/9.1, 10.1, 10.6

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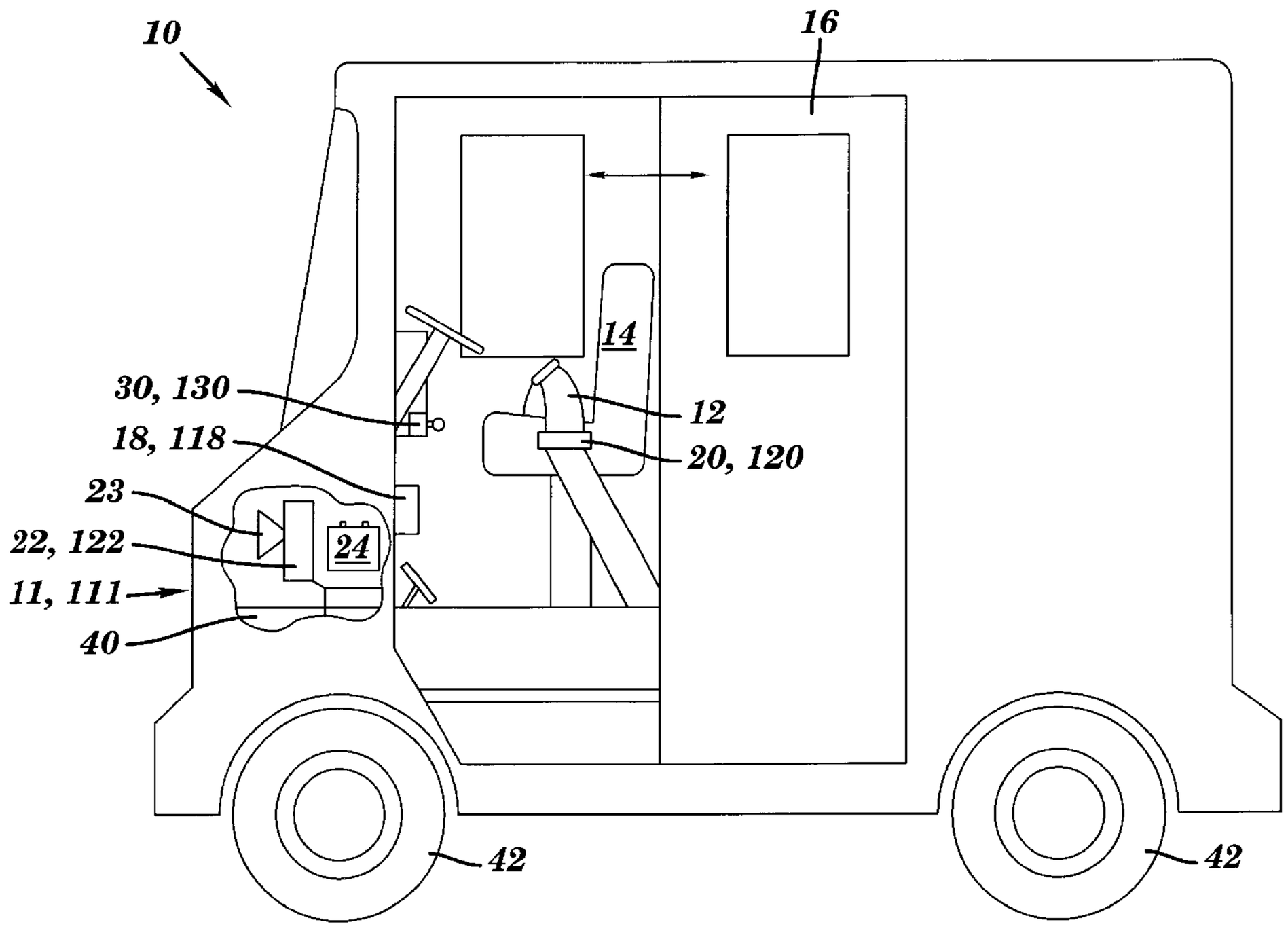
(57) **ABSTRACT**

An alarm system for a vehicle having a door and a seat belt that includes: a door position sensor; a seat belt position sensor; an alarm, operable when the vehicle is running, that sounds only when the door position sensor determines the door is open and the seat belt position sensor determines the seat belt is inactive. A method of preventing unsafe vehicle operation and a vehicle having the alarm system are also disclosed.

13 Claims, 4 Drawing Sheets



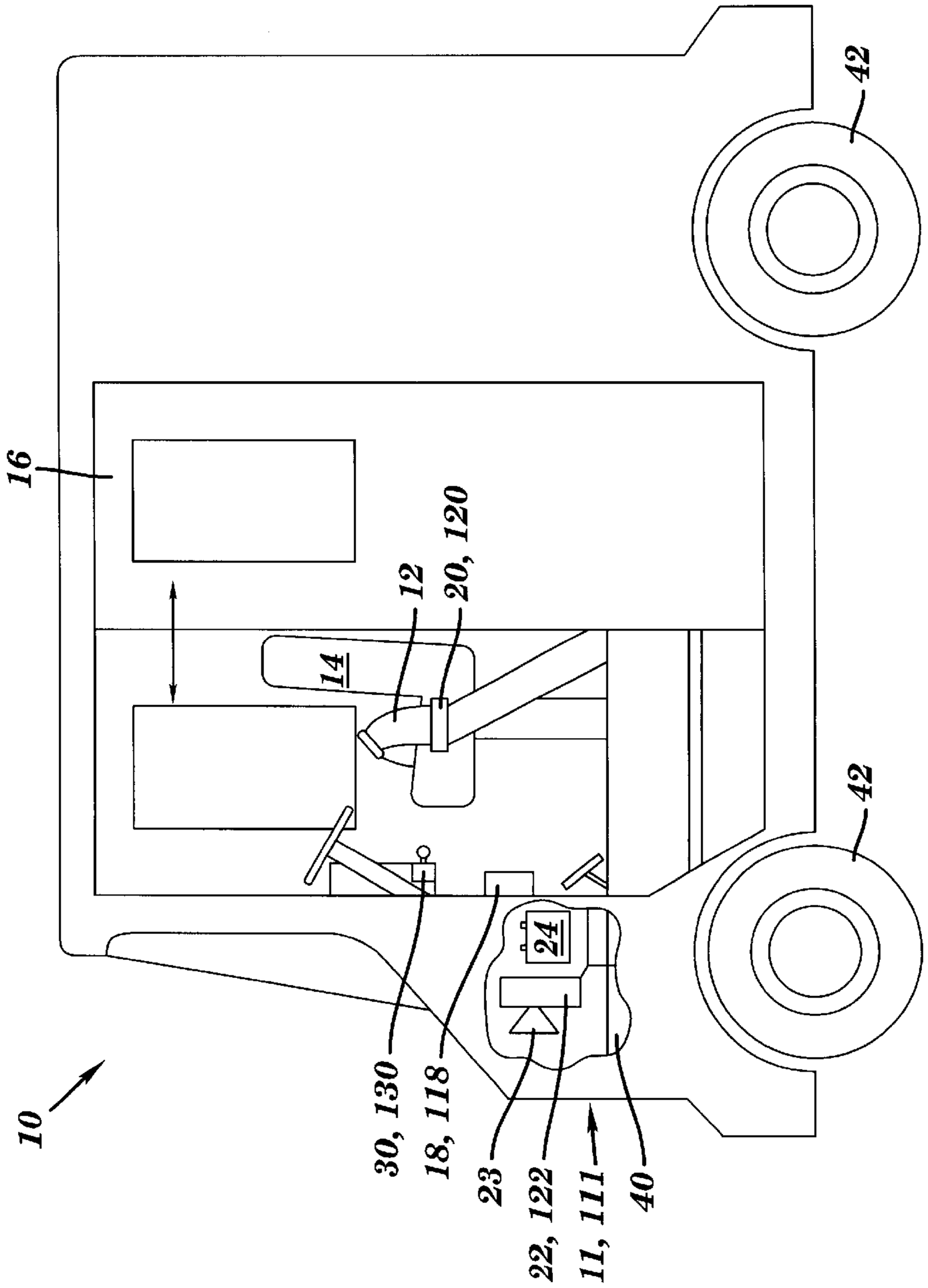


FIG. 1

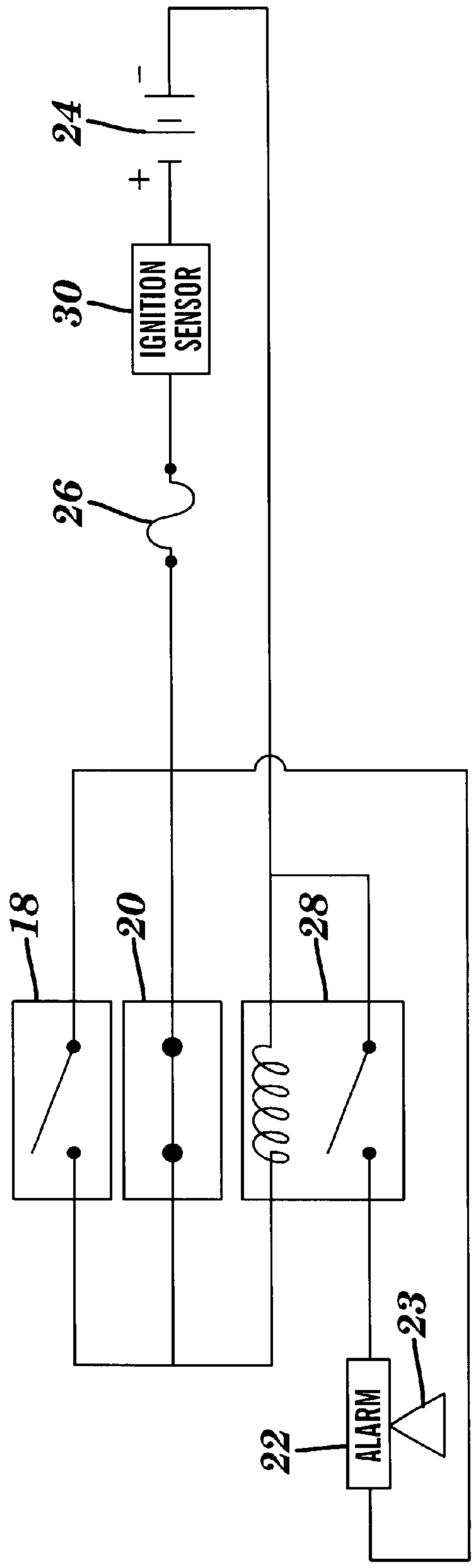


FIG. 2

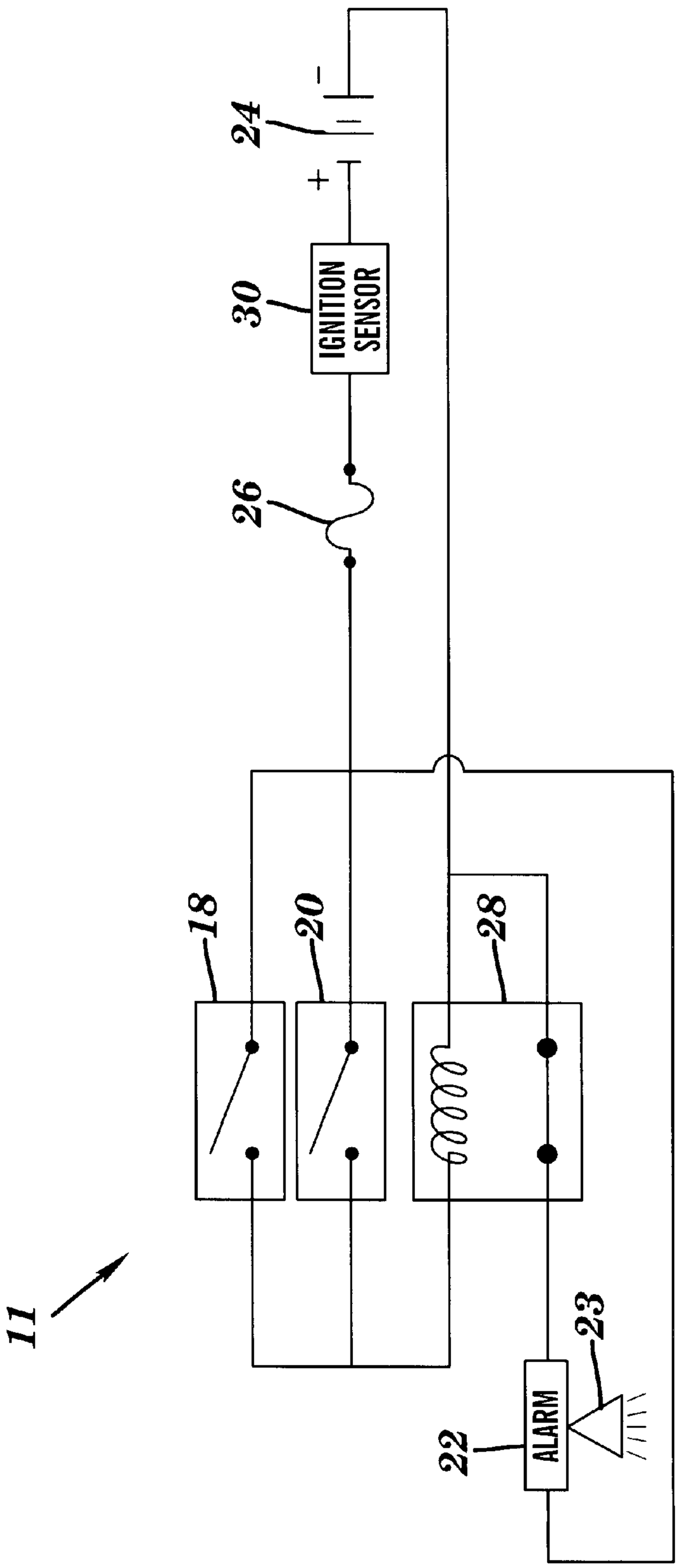


FIG. 3

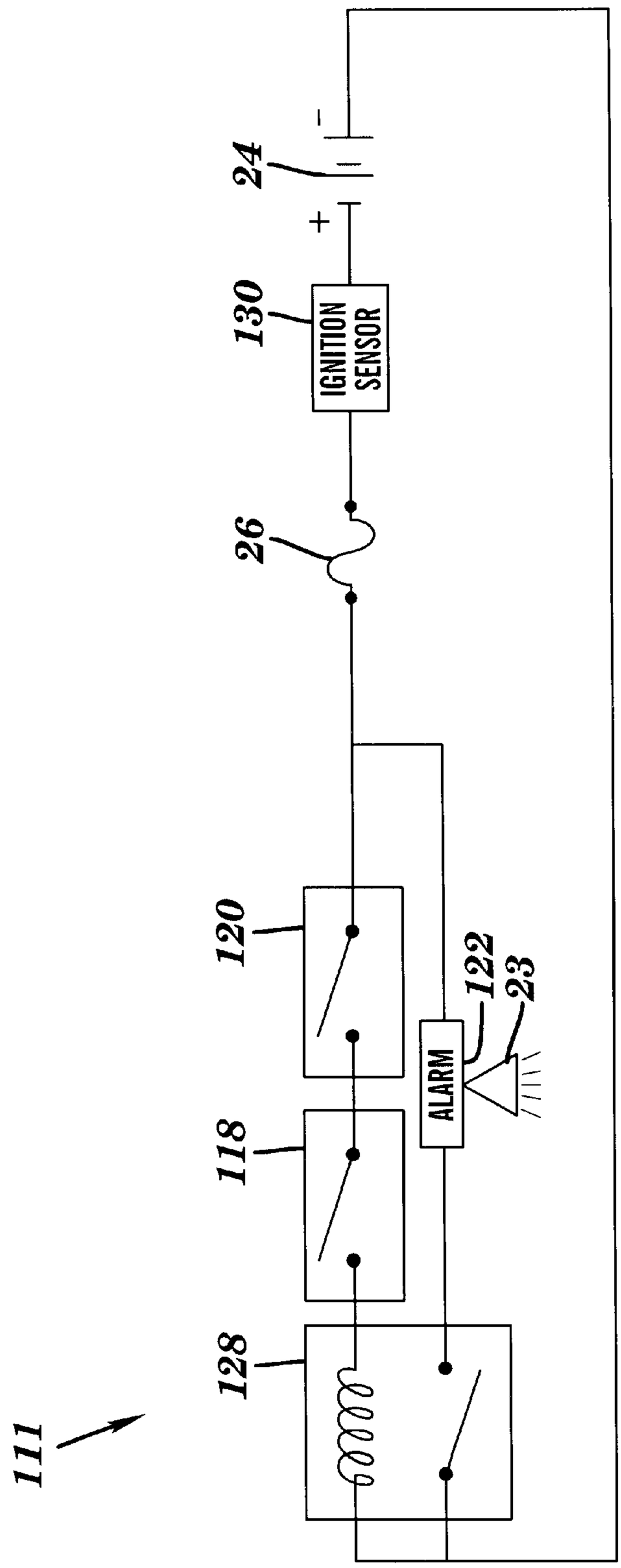


FIG. 4

ALARM SYSTEM AND METHOD FOR VEHICLE

BACKGROUND OF THE INVENTION

1. Technical Field

The present invention relates generally to a vehicle alarm system and, more particularly, to a vehicle alarm system and method for sounding an alarm only when a vehicle door is open and a seat belt is inactive.

2. Related Art

Almost all motor vehicles produced today have warning systems for certain vehicle conditions. For instance, U.K. Pat. No. 1,454,978 discloses a system that may warn a user when a vehicle door has been opened and the keys are still in the ignition or the lights are on.

One particular situation that is not addressed by the prior art is the combined evaluation of door position and seat belt position. An example of where this type operation is necessary is the motorized delivery vehicle field. In this field, it is convenient for a driver or occupant of a vehicle to leave their seat belt inactive and/or a door of the vehicle open so they may enter and exit the vehicle frequently. However, when both a door is open and a seat belt is inactive, an unsafe condition exists. For instance, it is possible for a driver to exit a running vehicle, which can potentially cause injury to the driver. Injury may also result to anyone, or anything, in proximity of the vehicle if the vehicle moves.

To prevent this occurrence, United States Postal Service regulations mandate that running delivery vehicles either have the driver door closed or the driver seat belt activated. Unfortunately, there is no alarm system that sounds only when both a door is open and a seat belt is disconnected.

Another shortcoming of prior art devices is that many turn off after a certain amount of time, i.e., they time out. As a result, a user becomes accustom to ignoring warning systems and potentially may operate a vehicle in an unsafe manner. Furthermore, a pedestrian may unknowingly enter an area where a vehicle is driverless and the alarm has timed out.

In view of the foregoing, there is a need in the art for an alarm system and method for a motor vehicle that sounds when both a seat belt is inactive and a door is open.

SUMMARY OF THE INVENTION

The invention provides a vehicle alarm system for a vehicle having a door and a seat belt, the vehicle alarm system comprising: a door position sensor; a seat belt position sensor; an alarm, operable when the vehicle is running, that sounds only when the door position sensor determines the door is open and the seat belt position sensor determines the seat belt is disconnected. The invention provides an alarm system that prevents unsafe operation of a delivery vehicle. The system may advantageously continue sounding until the unsafe condition is remedied.

In a second aspect of the invention is provided an alarm system for a motor vehicle having a door and a seat belt, the system comprising: first means for sensing when a door of the motor vehicle is open or closed; second means for sensing when a seat belt of the motor vehicle is active or inactive; and means for sounding an alarm, coupled to the first means and the second means, only when both the door is open and the seat belt is inactive.

A third aspect of the invention includes a method of preventing unsafe operation of a motor vehicle comprising the steps of: determining whether the motor vehicle is operative; determining whether a door of the motor vehicle is open or closed; determining whether a seat belt of the motor vehicle is active or inactive; and sounding an alarm when the motor vehicle is operative and both the door is open and the seat belt is inactive.

In a fourth aspect of the invention is provided a vehicle comprising: a motive power source for driving wheels of the vehicle; a battery; a door; a seat having a seat belt; and an alarm system having: a door position sensor; a seat belt position sensor; and an alarm that sounds only when the door position sensor determines the door is open and the seat belt position sensor determines the seat belt is inactive.

The foregoing and other features and advantages of the invention will be apparent from the following more particular description of preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The preferred embodiments of this invention will be described in detail, with reference to the following figures, wherein like designations denote like elements, and wherein:

FIG. **1** shows a vehicle having a vehicle alarm system in accordance with the invention;

FIG. **2** shows a first preferred embodiment of the vehicle alarm system; and

FIG. **3** shows the first preferred embodiment of the vehicle alarm system in an operative mode; and

FIG. **4** shows a second preferred embodiment of the vehicle alarm system.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Although certain preferred embodiments of the present invention will be shown and described in detail, it should be understood that various changes and modifications may be made without departing from the scope of the appended claims. The scope of the present invention will in no way be limited to the number of constituting components, the materials thereof, the shapes thereof, the relative arrangement thereof, etc., and are disclosed simply as an example of the preferred embodiment.

Referring to FIG. **1**, a vehicle **10** including a vehicle alarm system **11** in accordance with the invention is shown. As will become evident, vehicle alarm system **11** in accordance with the present invention provides an alarm sound only under the unsafe condition of a vehicle door being open and a seat belt of the vehicle being inactive, e.g., disconnected. For purposes of this disclosure, the use of the term "inactive" to describe seat belt position is meant to capture any situation in which a seat belt is not in proper use, e.g., is disconnected, spooled, etc. Similarly, "activated" is meant to capture any situation in which a seat belt is in proper use, e.g., connected, coupled, unspooled, etc. In like manner, the term "open" as it is applied to a vehicle door may be any state in which the door is not properly secured, i.e., closed. Hence, an "open" door **16** may not simply be open such that a user may exit through it, an "open" door **16** may be, for example, ajar, unlocked, etc.

Vehicle **10** includes a seat belt **12** for securing an occupant (not shown) to a seat **14** and a door **16**. While seat **14** is shown as being a driver seat, the teachings of the present invention may be applied to any seat of a vehicle. Similarly, while door **16** is shown as a sliding door, it may be any type of vehicle door known to those skilled in the art. In accordance with the invention, a vehicle alarm system **11** is

provided on vehicle **10**. Alarm system **11** generally includes a door position sensor **18** and a seat belt position sensor **20** and an alarm **22**. Alarm **22** includes a speaker **23** or some other sounding mechanism capable of alerting an occupant or those in proximity to vehicle **10** of an unsafe condition. Alarm **22** is preferably provided within an engine compartment of vehicle **10** and may be a part of vehicle **10** horn system as is known in the art.

Referring to FIG. **2**, a first preferred embodiment of vehicle alarm system **11** is shown. In this embodiment, door position sensor **18** is coupled to seat belt position sensor **20** in a parallel electrical circuit. Energy is preferably provided to system **11** by vehicle battery **24** through a fuse **26**. A relay **28** is positioned between sensors **18**, **20** and alarm **22**. Relay **28** is energized to sound alarm **22** only upon the condition that door position sensor **18** determines that door **16** is open and seat belt position sensor **20** determines seat belt **12** is inactive. In a preferred setting, alarm system **11** also includes an ignition sensor **30** that energizes system **11** only when vehicle **10** is operating, e.g., the vehicle engine is running.

With special regard to seat belt position sensor **20**, one with skill in the art will recognized that a number of different sensors that operate in different fashions are available. For instance, sensors may detect whether the male and female parts of a seat belt are coupled or whether an amount of belt has been fed from a seat belt spool. Accordingly, any type of seat belt position sensor that determines inactivity of seat belt **12** may be suited.

In the preferred embodiment of FIG. **2**, when door **16** is open, door position sensor **18** is in a non-conductive state, and while seat belt **12** is inactive, seat belt position sensor **20** is in a non-conductive state. Accordingly, FIG. **2** shows alarm system **11** in an inoperative mode because seat belt position sensor **20** determines that seat belt **12** is active (i.e., conductive state), which energizes relay **28** to prevent energizing of alarm **22**. In this instance, door position sensor **18** indicates that door **16** is open, i.e., sensor **18** is in a non-conductive state.

As shown in FIG. **3**, when both seat belt **12** is inactive and door **16** is open, relay **28** is not energized and alarm **22** is energized, hence, sounding an alarm that warns an occupant or those in proximity of vehicle **10** of an unsafe condition. The alarm continues until either door **16** is closed or seat belt **12** is activated. Accordingly, the alarm will not stop until the unsafe condition is remedied, i.e., it does not time out.

It should be recognized that a number of door position sensors **20** may be provided to accommodate a multiple doored vehicle **10**. Similarly, more than one seat belt position sensor **18** may be provided to accommodate all seats within a vehicle **10**. These components could be added in parallel to the already described sensors **18**, **20**.

FIG. **4** shows a second preferred embodiment of alarm system **111** in which sensors **118**, **120** are coupled in a series electrical circuit. In this embodiment, door position sensor **118** and seat belt position sensor **120** are shown in a condition in which door **16** is closed and seat belt **12** is activated. In this embodiment, when door **16** is closed, door position sensor **118** is in a non-conductive state, and while seat belt **12** is activated, seat belt position sensor **120** is in a non-conductive state. As shown in FIG. **4**, alarm system **111** is inoperative. Only when both door **16** is open and seat belt **12** is uncoupled will sensors **118** and **120** conduct current to energize relay **128** and, hence, energize alarm **122** to sound. Similarly to the first embodiment, the second embodiment may also include an ignition sensor **130** between battery **24** and the rest of the circuitry.

Similar to the first embodiment, a number of door position sensors **120** may be provided to accommodate a multiple doored vehicle **10** and more than one seat belt position sensor **118** may be provided to accommodate all seats within a vehicle **10**. These components could be added in series adjacent the already described sensors **118**, **120**.

It should be recognized that while sensors **18**, **20**, **118**, **120** have been illustrated as switch sensors that a variety of different sensors, e.g., pressure sensors, infrared sensors, etc., may also be suited for operation in the invention. The scope of the invention should, therefore, not be limited to any one type of sensor.

The invention also includes a method of preventing unsafe operation of a motor vehicle comprising the steps of: determining when motor vehicle **10** is operative; determining whether door **16** of motor vehicle **10** is open or closed; determining whether a seat belt **12** of motor vehicle **10** is coupled or uncoupled; and sounding an alarm **22**, **122** when motor vehicle **10** is operative and both door **16** is open and seat belt **12** is inactive.

Returning to FIG. **1**, the invention also includes a vehicle **10** having an alarm system **11**, **111**. Vehicle **10** includes: a motive power source **40** (e.g., engine, motor, etc.) for driving wheels **42** of vehicle **10**, a battery **24**, a door **16**, a seat **14** having a seat belt **12**, and an alarm system having a door position sensor **18**, a seat belt position sensor **20** and an alarm **22** that sounds only when door position sensor **18** determines door **16** is open and seat belt position sensor **20** determines seat belt **12** is inactive. Vehicle **10** may also include an ignition sensor **30** for determining when vehicle **10** is running. Alarm **22** of vehicle **10** may include a speaker **23** or other sounding mechanism and is powered by battery **24** of vehicle **10**.

While this invention has been described in conjunction with the specific embodiments outlined above, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art. Accordingly, the preferred embodiments of the invention as set forth above are intended to be illustrative, not limiting. Various changes may be made without departing from the spirit and scope of the invention as defined in the following claims.

We claim:

1. A vehicle alarm system for a vehicle having a door and a seat belt, the vehicle alarm system comprising:

a door position sensor;

a seat belt position sensor; and

an alarm, operable when the vehicle is running, that sounds only when both the door position sensor determines the door is open and the seat belt position sensor determines the seat belt is inactive.

2. The vehicle alarm system of claim **1**, further comprising an ignition sensor for determining when the vehicle is running.

3. The vehicle alarm system of claim **1**, wherein the door sensor and the seat belt position sensor are coupled in parallel.

4. The vehicle alarm system of claim **1**, further comprising a relay for energizing the alarm when the door position sensor determines the door is open and the seat belt position sensor determines the seat belt is inactive.

5. The vehicle alarm system of claim **1**, wherein the door position sensor and the seat belt position sensor are coupled in series.

6. The vehicle alarm system of claim **1**, wherein the alarm includes a speaker.

7. The vehicle alarm system of claim **1**, wherein the system is powered by a battery of the motor vehicle.

8. The vehicle alarm system of claim **1**, further comprising a fuse.

9. An alarm system for a motor vehicle having a door and a seat belt, the system comprising:

first means for sensing when a door of the motor vehicle is open or closed;

second means for sensing when a seat belt of the motor vehicle is active or inactive; and

means for sounding an alarm, coupled to the first means and the second means, only when both the door is open and the seat belt is inactive.

10. A method of preventing unsafe operation of a motor vehicle comprising the steps of:

determining whether the motor vehicle is operative;

determining whether a door of the motor vehicle is open or closed;

determining whether a seat belt of the motor vehicle is active or inactive; and

sounding an alarm when the motor vehicle is operative and both the door is open and the seat belt is inactive.

11. A vehicle comprising:

a motive power source for driving wheels of the vehicle;

a battery;

a door;

a seat having a seat belt; and

an alarm system having:

a door position sensor;

a seat belt position sensor; and

an alarm that sounds only when both the door position sensor determines the door is open and the seat belt position sensor determines the seat belt is inactive.

12. The vehicle of claim **11**, further comprising an ignition sensor for determining when the vehicle is running.

13. The vehicle of claim **11**, wherein the alarm includes a speaker.

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